

Chapter 1

Introduction

Location and Physiography

This report describes the onshore geology of the area covered by Sheet 7-NE-D (Ma On Shan) and part of Sheet 7-NE-C located on the south side of Tolo Harbour, New Territories. The 1:5 000 map sheet covers an area of 1125 hectares (Figure 1), extending north from the slopes of Ma On Shan to Tolo Harbour, and west from Nai Chung to the new town of Ma On Shan which is being built mostly on reclaimed ground (Plate 1). In this report, the mapped area is referred to as 'the district'. The district is dominated by the densely vegetated, steep-sided slopes of Ngau Ngak Shan (677 m) and Ma On Shan (702 m) forming the highest points and covering part of the Ma On Shan Country Park. Ruins of the Ma On Shan mining operations of the 1960s and 1970s litter the lower northern slopes of Ngau Ngak Shan. Access to the urban areas is gained by sealed public roads, and well-worn foot paths lead to the summits of Ngau Ngak Shan and Ma On Shan. There are several overgrown paths on the slopes of Ngau Ngak Shan that once serviced mine prospects.



Plate 1 - The Ma On Shan Reclamation in July 1990 from the Northern Slopes of Ngau Ngak Shan (4325 3055)

The district includes a large area of reclaimed ground known as the Ma On Shan reclamation. New roads and buildings on the Ma On Shan reclamation are planned or under construction and the development is likely to expand rapidly once new transport links are completed.

Previous Work

The first geological investigations in Hong Kong were undertaken by Brock, Uglow, Schofield & Williams between 1923 and 1927 under an agreement between the Colonial Office and the University of British Columbia. A geological map of Hong Kong was published at a scale of 1:84 480 in 1936, and several papers relating to this work were published, including Brock & Schofield (1926), Uglow (1926)

and Williams (1943; *et al.*, 1945). The first memoir, based largely on this work, was produced by Davis (1952), followed later by a detailed description of the geology of the Territory by Ruxton (1960).

In 1971, Allen & Stephens published the first comprehensive geological map at a 1:50 000 scale together with a descriptive report. This survey remained the definitive work on the geology of the Territory until 1982 when the Hong Kong Geological Survey commenced the 1:20 000 mapping programme. The Sha Tin district (Sheet 7) was surveyed between 1983-84 (Addison & Purser, 1986) and a description of the geology is contained within Memoir No. 1 (Addison, 1986). Bennett (1984a; 1984b; 1984c) reviewed the stratigraphy and tectonics of the Territory. The terrain characteristics, superficial deposits and engineering geology aspects were described in the Geotechnical Areas Studies Programme Report No. II, Central New Territories (GCO, 1985). Frost (1991) described the subsurface geology of the Ma On Shan reclamation in a study to define the extent of marble, the degree of karstification and to examine the need for special foundation requirements.

The Designated Area Project

Marble containing cavities was discovered in 1989 beneath superficial deposits of the Ma On Shan reclamation. In 1990, the Geotechnical Control Office initiated a programme of exploration and drilling to delineate the marble substrate, and to assist prediction of cavitous areas. A geological map at a scale of 1:5 000 was proposed to record the findings of the survey along with a consultants report. Some 28 boreholes were drilled by the Geotechnical Control Office to various depths. These boreholes were continuously sampled by rotary coring in the superficial deposits and the solid rocks. Additional information was obtained from the logs and core samples of many public and private ground investigation boreholes. As a result of this initial investigation, and following the precedent set in Yuen Long in 1987, a region was defined as the Ma On Shan Designated Area. The Designated Area at Ma On Shan has an area of some 56 hectares consisting of mostly reclaimed fill-platform with surface levels at about 5 m above the Principal Datum. The limits of the Designated Area defined by the Hong Kong Geological Survey were based on the borehole evidence then available and the extrapolation of the geological structures originally defined by Addison (1986). Most boreholes drilled for geotechnical purposes were put down in sales Site Area 90 for the Hong Kong Government Housing Authority. Following the release of the consultant's report (Frost, 1991), the Designated Area was redefined into Scheduled Area No. 4 (Figure 2).

Data Sources

A large volume of borehole data exists from site investigations in the Ma On Shan area (Figure 3). This data set has been compiled onto a computerised database to allow easy retrieval, evaluation and interpretation. The report text is based on a review of site investigation data up to September 1994. However, the computerised database is regularly updated as new information is received and should therefore be of continuing interest to all those involved with geotechnical appraisals or design in the district.

This report supplements the findings of previous workers (Addison & Purser, 1986; Addison, 1986; Frost, 1991), and many details are not duplicated here. A field survey was carried out over a period of 21 days during the spring of 1990 (Figure 4). A desk study of borehole data from site investigations in the Ma On Shan reclamation greatly assisted interpretation of the subsurface geology, and several new boreholes were commissioned to help delineate contact relationships. Geotechnical Information Unit reports were consulted extensively in determining the stratigraphy of superficial deposits. Grid references used in this report are based on the Hong Kong metric map series HM20C (1:20 000).

A total of 77 rock samples were collected during the present mapping. Of these, 21 specimens were thin sectioned and 12 samples were sent to the University of Nottingham, U.K., for whole rock major and trace element geochemical analysis. Two samples have been collected from the district for Rb-Sr age determinations at the NERC Isotope Geosciences Laboratory, Keyworth, U.K.

The mapping of the onshore geology was facilitated by the use of aerial photographs, particularly those taken in 1963. A satellite image of the Pearl River Estuary, although at a small scale, gave an excellent overview of the district and supplied further evidence of structural trends determined from field mapping.

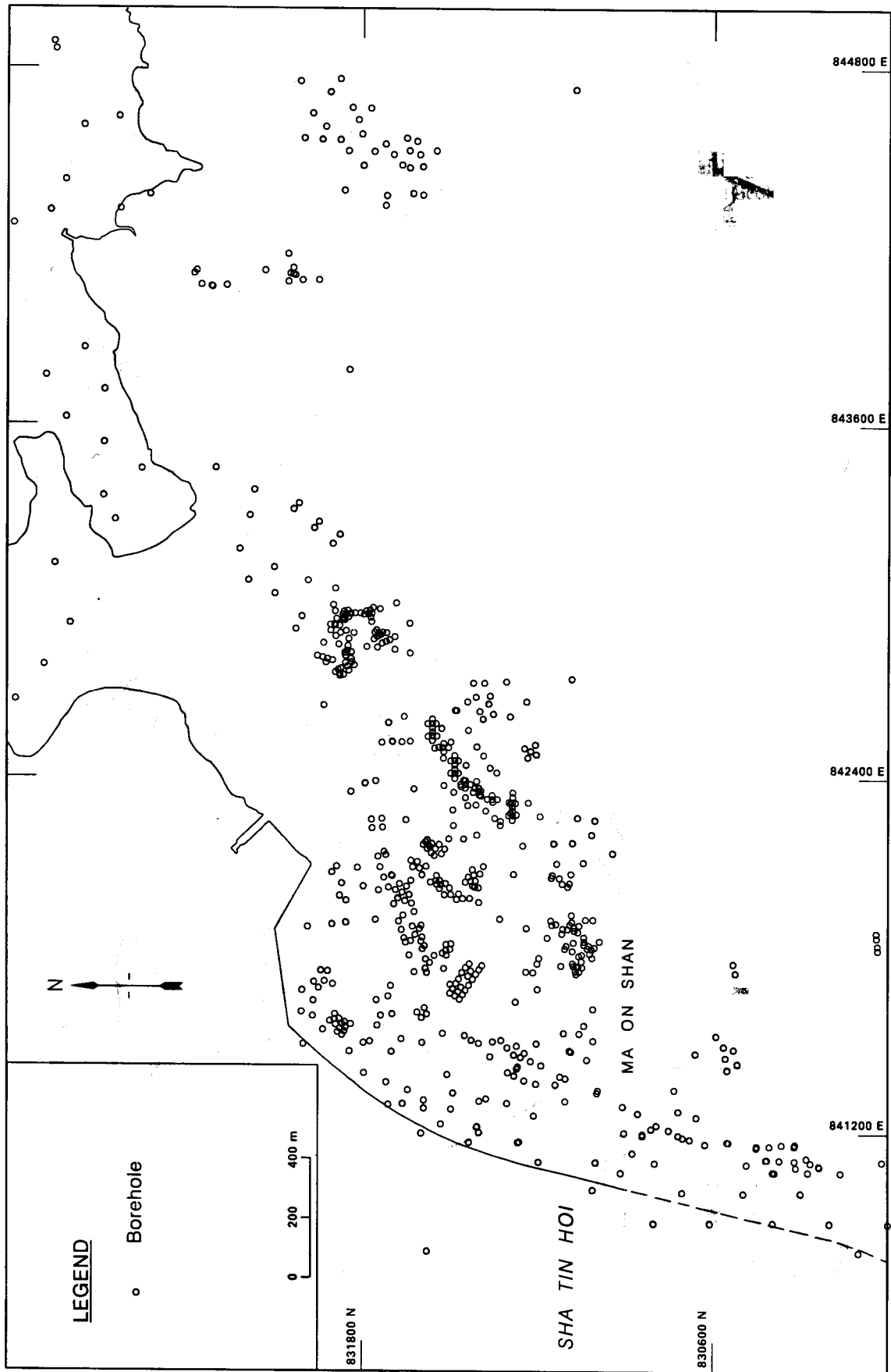


Figure 3 - Locations of Boreholes Drilled for Ma On Shan Infrastructure Developments

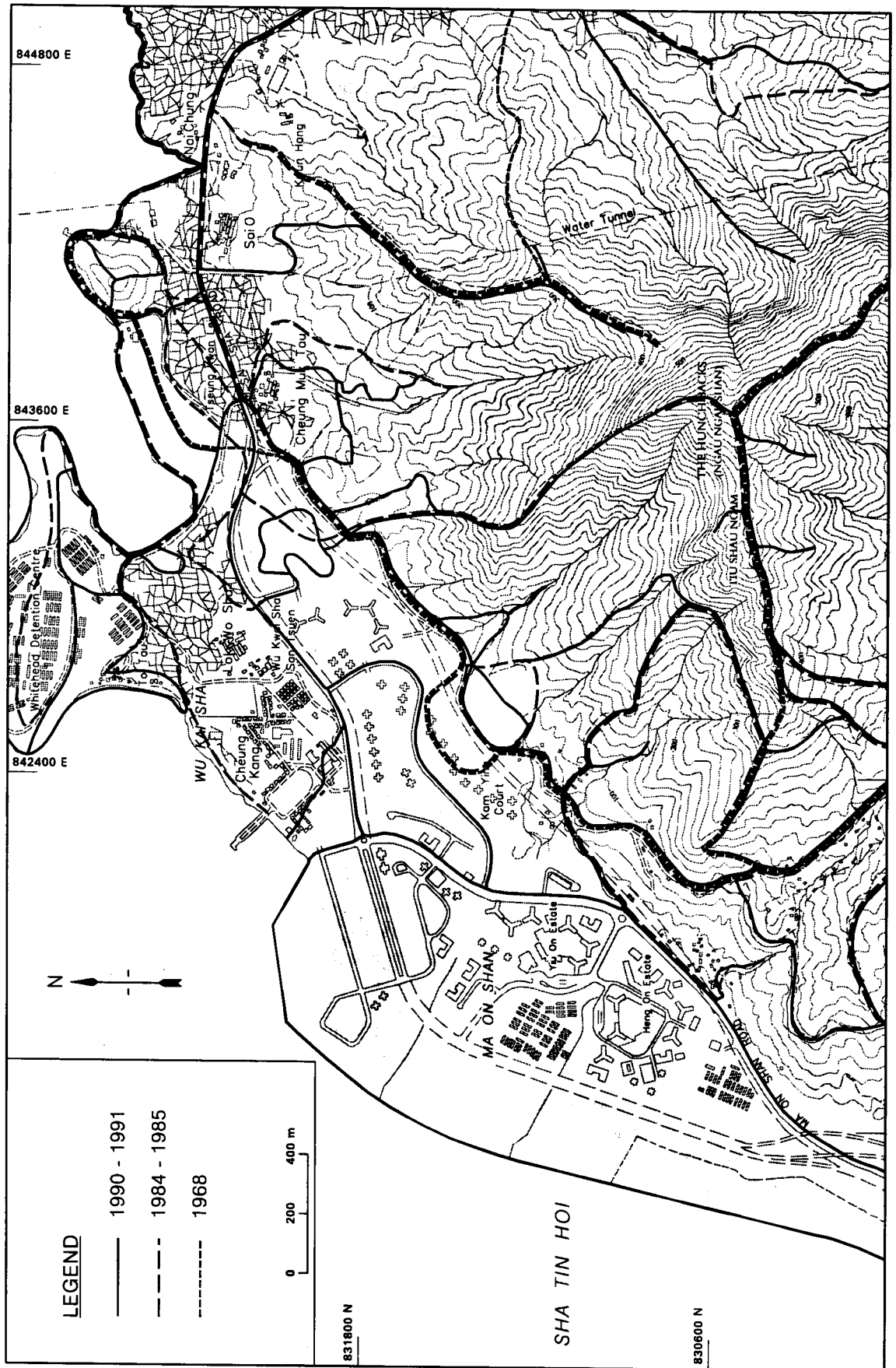


Figure 4 - Traverses Undertaken during 1968, 1984-85 and 1990-91 Field Surveys

The 1:5 000-scale geological map which accompanies this report supplements the information shown on the published map at a scale of 1:20 000 and also provides a detailed interpretation of the sub-surface geology based largely on new borehole information. The geological map only shows the solid geology, although the superficial geology is discussed in this report.

All the records from this project, including rock samples, thin sections, manuscript maps and analytical data, are held in the archives of the Hong Kong Geological Survey, Geotechnical Engineering Office. The powders used in geochemical analysis are also retained in the Hong Kong Geological Survey archives, and a split is kept at the British Geological Survey, Keyworth.